

SECTION I
AMENDMENTS

IN THE CLAIMS:

Please amend claims 7, 8, 9, 11, 18 and 20 as set forth below.

Complete Listing of the Claims

Upon entry of the present amendment, the claims will stand as follows. The following listing of the claims will replace all prior versions and listings of the claims in the present application:

1. (Previously presented) A method for reducing and/or removing nitrogenous products from a marine recirculating aquaculture system, the method comprising:
 - housing an aquatic species in a rearing tank containing salt water medium, wherein the salt water medium comprises sulfates and is contaminated with at least ammonia and nitrates;
 - transferring the salt water medium from the rearing tank through a downstream filter for separating solid materials from the salt water medium;
 - transferring separated solids and at least some of the salt water medium to a sludge holding tank, wherein the sludge holding tank comprises a media substrate for growth of anaerobic microorganisms active in sulfate reduction;
 - retaining the separated sludge and salt water medium in the sludge holding tank a sufficient time for generating sulfides through metabolic reduction of sulfate in the salt water medium by the anaerobic microorganisms active in sulfate reduction;
 - transferring the salt water medium comprising the sulfides from the sludge holding tank to a denitrification unit positioned downstream from the sludge tank, wherein the denitrification unit comprises a fixed bed of media substrate for growth of anaerobic microorganisms active in sulfide oxidization and nitrate reduction;
 - retaining the salt water medium in the denitrification unit for a sufficient time for oxidizing sulfides to sulfates and reducing nitrates to nitrogen gas by the microorganisms active in sulfide oxidization and nitrate reduction;
 - transferring the salt water medium from the denitrification unit to a nitrifying moving bed bioreactor (MBB) positioned downstream from the denitrification unit, wherein the

MBB comprises moving suspended media substrate for growth of aerobic microorganisms active in nitrification;

retaining the salt water medium in the MBB for a sufficient time to reduce ammonia concentration in the salt water medium; and

transferring the salt water medium from the MBB to the rearing tank for recirculation.

2. (Original) The method according to claim 1, wherein the microorganisms active in sulfate reduction comprises bacteria from the genera *Desulfobacter*, *Desulfobacterium*, *Desulfovibrio* or *Desulfotomaculum*.
3. (Original) The method according to claim 1, wherein the microorganisms active in sulfide oxidation/nitrate reduction comprises a bacteria from the genera *Thiobacillus* or *Thiomicrospira*.
4. (Original) The method according to claim 1, wherein the media substrate in the sludge holding tank is fabricated from polyethylene.
5. (Previously presented) The method according to claim 1, wherein the flow rate through the components including the rearing tank, denitrification unit, filter or MBB from about $0.1 \text{ m}^3/\text{hr}$ to about $10 \text{ m}^3/\text{hr}$.
6. (Original) The method according to claim 5, wherein the flow rate is the same for all components or different for each component.
7. (Currently amended) The method according to claim 1, wherein the pH in the sludge holding tank and denitrification unit is ~~maintain~~maintained in a range from about 6.8 to about 9.
8. (Currently amended) The method according to claim 7 wherein the pH in the sludge holding tank and denitrification unit is ~~maintain~~maintained at above 7.
9. (Currently amended) A marine recirculating aquaculture system, the system comprising:
at least one aquatic species rearing tank, wherein the rearing tank comprises a salt water medium;

a sludge holding tank positioned downstream from the rearing tank and in fluid communication therewith, wherein the sludge holding tank comprises a media substrate ~~for growth of wherein one or more~~ microorganisms active in sulfate reduction are growing on the media substrate;

a denitrification unit positioned downstream from the sludge tank and rearing tank and in fluid communication therewith, wherein the denitrification unit comprises a media substrate ~~for growth of wherein one or more~~ anaerobic microorganisms active in both sulfide oxidization and nitrate reduction are growing on the media substrate; and

a nitrifying moving bed bioreactor positioned downstream from the denitrification unit and upstream of the rearing tank and in fluid communication therewith, wherein the nitrifying moving bed bioreactor comprises a media substrate ~~for growth of wherein one or more~~ microorganisms active in nitrification are growing on the media substrate.

10. (Original) The system according to claim 9, further comprising a drum screen filter positioned between the rearing tank and the sludge tank and in fluid communication therewith, wherein the drum screen filter separates solids transferred from the tank in the recirculating salt water medium with subsequent transference of such separated solids to the sludge tank.

11. (Currently amended) The system according to claim 9, wherein the nitrifying moving bed bioreactor comprises

an inlet and outlet for movement of the salt water medium therethrough;

a suspended media substrate ~~for growth of aerobic microorganisms active in nitrification~~, wherein the suspended media is kept in motion by the movement of the salt water medium and wherein the substrate has one or more aerobic microorganisms active in nitrification growing thereon; and

an aerator to inject air or oxygen into the salt water medium for effective aerobic nitrification by the microorganisms.

12. (Original) The system according to claim 9, wherein the media substrate comprises polyethylene beads.

13. (Original) The system according to claim 9, further comprising an automatic monitor and control system communicatively connected to the different system components.
14. (Original) The system according to claim 9, wherein the denitrification unit is an upflow fixed substrate column.
15. (Original) The system according to claim 10, further comprising a conduit system for connecting the rearing tank, drum screen filter, sludge holding tank, denitrification unit and moving bed bioreactor.
16. (Original) The system according to claim 9, wherein the moving bed bioreactor is an upflow column.
17. (Original) The system according to claim 9, further comprising a plurality of sampling pumps and/or in line monitoring devices located in at least the rearing tank, drum screen filter, sludge holding tank, denitrification unit and moving bed bioreactor to measure water temperature, oxygen content, pH, ammonia, nitrite, nitrate, sulfate, and/or sulfide levels.
18. (Currently amended) A method for reducing and/or removing nitrogenous species from a marine recirculating aquaculture system, the method comprising:
 - rearing an aquatic species in a rearing zone containing salt water medium comprising sulfates, ammonia and nitrates;
 - filtering the salt water medium from the rearing zone to separate solids from the salt water medium and yield a filtered salt water medium;
 - reducing sulfate in the filtered salt water medium to sulfide by action of anaerobic microorganisms adapted for sulfate reduction, to yield sulfide-containing salt water medium;
 - oxidizing sulfides in the sulfide-containing salt water medium to sulfates and reducing nitrates in the sulfide-containing salt water medium to nitrogen gas, by action of anaerobic microorganisms adapted ~~therefor~~ to both oxidize sulfides and reduce nitrates, to yield a denitrified saltwater medium;

reducing ammonia in the denitrified salt water medium, by action of aerobic microorganisms adapted therefore, to yield an ammonia-reduced salt water medium; and recycling the ammonia-reduced salt water medium to the rearing zone.

19. (Previously presented) The method of claim 18, wherein the step of reducing ammonia is carried out in a moving bed bioreactor (MBB).
20. (Currently amended) The method of claim 18, wherein said anaerobic microorganisms adapted for sulfate reduction comprise bacteria of at least one of the genera selected from the group consisting of *Desulfobacter*, *Desulfobacterium*, *Desulfovibrio* and *Desulfotomaculum*, and said anaerobic microorganisms adapted for oxidizing sulfides in the sulfide-containing salt water medium to sulfates and reducing nitrates in the sulfide-containing salt water medium to nitrogen gas, ~~comprise~~comprise bacteria of at least one of the genera selected from the group consisting of *Thiobacillus* and *Thiomicrospira*.

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